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University of Illinois College of Agriculture Cooperative Extension Service Circular 880

A Simple RIGID FRAME GREENHOUSE For Home Gardeners

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This circular describes a rigid frame greenhouse for home use which is attractive and can be constructed at low cost. It can be built with common tools, and the frames can be prefabricated indoors during inclement weather.

Covering. This greenhouse is designed for covering with rigid fiberglass panels or with film plastics such as weatherable vinyl, or inexpensive polyethylene. Construction of the framing is slightly different for corrugated fiberglass than for flat fiberglass and the film plastics (see plan in the center fold). For descriptions and recommended thicknesses of different plastic materials suitable for greenhouses, refer to University of Illinois Circular 879, *Home Greenhouses.*

Building the frames. The rigid frames are made of 2″ x 4″ construction grade fir lumber (or other grades and species having equal strength). A jig or pattern forming the dimensions given in the plan (center fold) can be made by nailing boards to a wooden floor, plywood sheets, or to other boards. The 2″ x 4″ members are then cut and fitted in the jig. The frames are made rigid by gluing and nailing ⅜″ AC exterior-grade plywood gussets over the joints (Fig. 1). Resorcinol-resin glue, which is waterproof and which sets under low pressure at normal air temperatures, is recommended for greenhouse construction. The frames should be stored level for 24 hours after nailing and gluing the gussets. A complete frame can be made from two 10-foot 2″ x 4″ members.

Size of greenhouse. The frames should be spaced according to the width and kind of the plastic to be used, but not wider than 36″ on center. Frames can be spaced 32 inches on center for 34-inch wide corrugated fiberglass, or 36 inches on center for polyethylene, vinyl, or flat fiberglass. Convenient greenhouse sizes for these frame spacings are 10′ x 10′8″ (5 frames) or 10 x 15 (6 frames), respectively. The techniques described in this circular can be used to build frames for a lean-to greenhouse (half frames) or for a greenhouse of larger dimensions.

Foundation. Two solid and inexpensive foundations are shown in the plan (center fold). The concrete foundation is recommended for a permanent, trouble-free installation (Fig. 2). Framing anchors or angle-iron braces attach the frames to the sill plate and foundation. Pieces cut 2½ inches wide from 2½- or 3-inch angle-iron and drilled for ⅜-inch bolts make excellent anchors.

Floor. A center walk can be made of concrete, flagstones, stepping stones, or pea-gravel and should be raised and sloped for run-off of water.

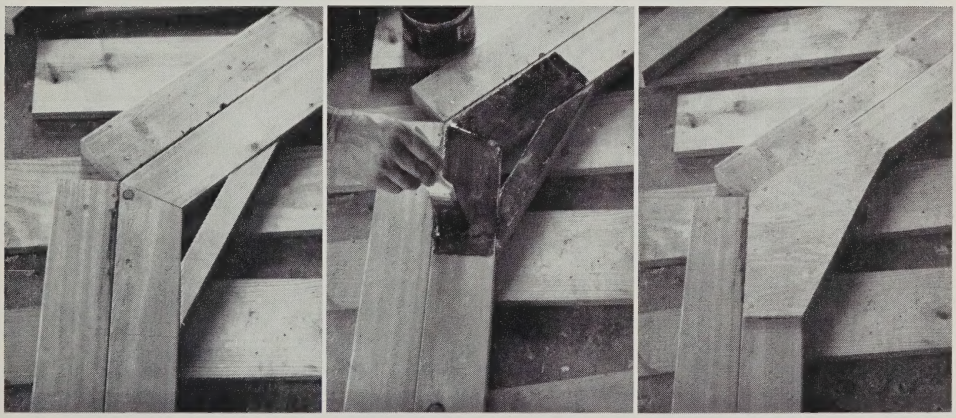
Crushed rock or stones can be placed under the benches for neat appearance and to catch excess water.

Installation of plastic. The frames must be notched at the peak and eaves of the roof to receive continuous 1″ x 4″ members for film plastics or flat fiberglass (Fig. 3). One edge of the eave and peak members must be beveled to form a smooth corner surface for application of the plastic. This additional cutting and fitting is not necessary for installation of corrugated fiberglass (Fig. 4).

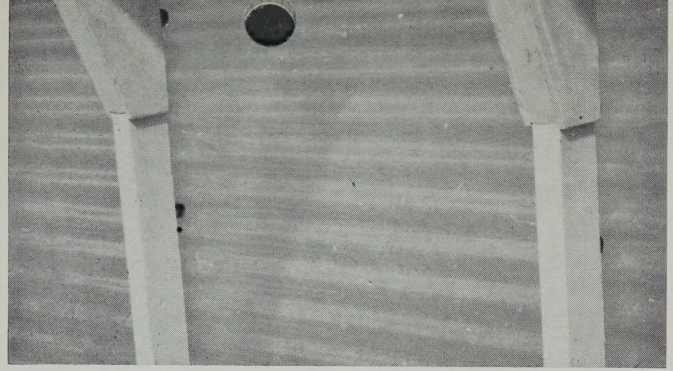
Film plastics (vinyl or polyethylene) are attached with painted 1″ x 2″ fir or redwood strips nailed to the frames (Fig. 3). Flat fiberglass can be attached with round-head screws backed with neoprene washers.

The roof can be easily covered with corrugated fiberglass by cutting 10-foot panels in half. This will allow a 3- to 4-inch overhang at the eave. Two 34-inch wide corrugated panels, installed horizontally with proper overlap, exactly covers one side. Special rubber or redwood closure strips are used to seal along the edges of the wall and roof (Fig. 4). Detailed installation instructions, available from fiberglass manufacturers and suppliers, should be obtained before construction. Flat, rather than corrugated fiberglass, may be used for easier covering of the ends.

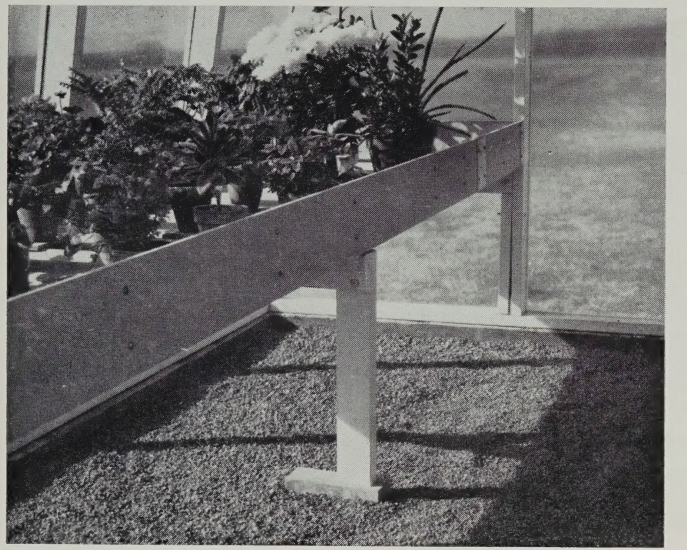
Benches. The greenhouse is designed for two 30- to 36-inch wide benches. The plan shows how to construct supports for the bench shown in Fig. 5. A permanent bench to rest on the pipe supports can be made of cypress or redwood boards. Prefabricated benches made of asbestos cement (Fig. 5) or redwood are available from greenhouse supply companies.



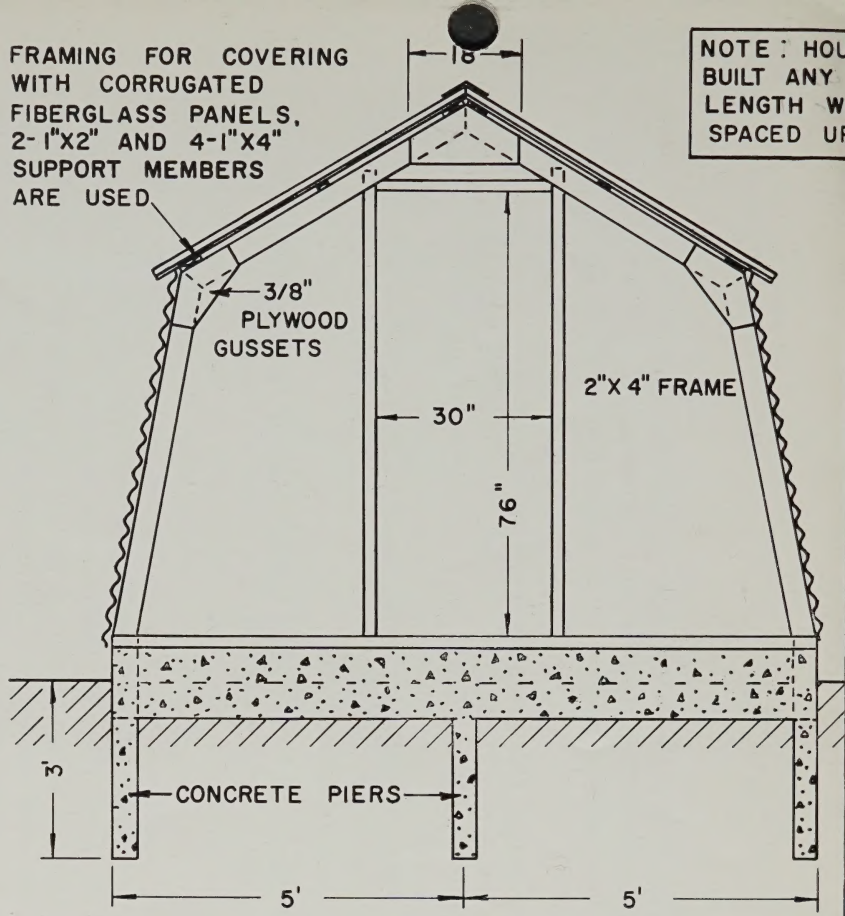
A rigid frame formed in a jig with plywood gussets being glued and nailed over the joints. Note the filler block which may be cut from a 2″ x 2″ (shown) or 2″ x 4″ member. Fourpenny nails secure the gussets until the glue dries. (Fig. 1)



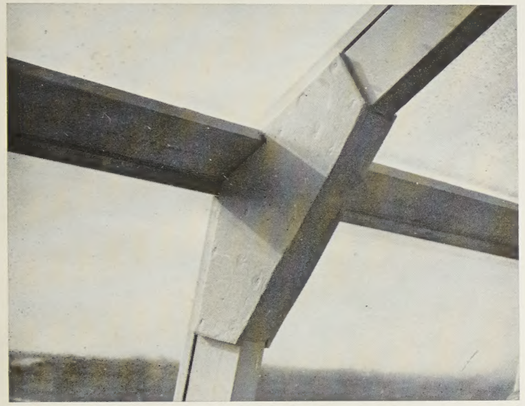
The installation of corrugated fiberglass by means of wood screws and closure strips. (Fig. 4)



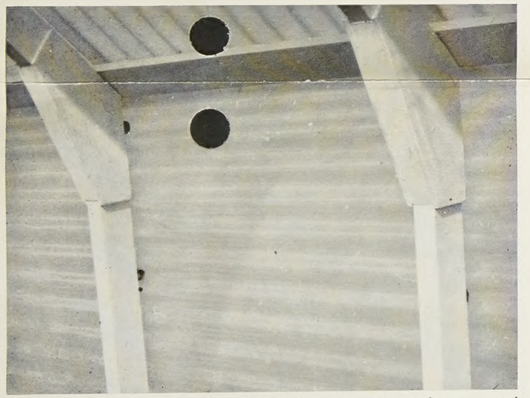
Asbestos cement benches for the greenhouse. (Fig. 5)



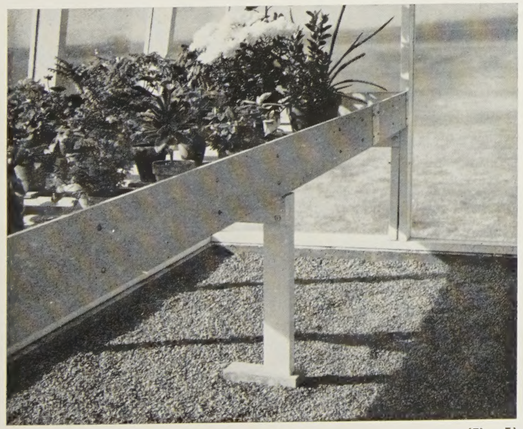
Concrete foundation with sill ready for rigid frames. (Fig. 2)



The eaves of the roof, showing the notched frames. (Fig. 3)



The installation of corrugated fiberglass by means of wood screws and closure strips. (Fig. 4)



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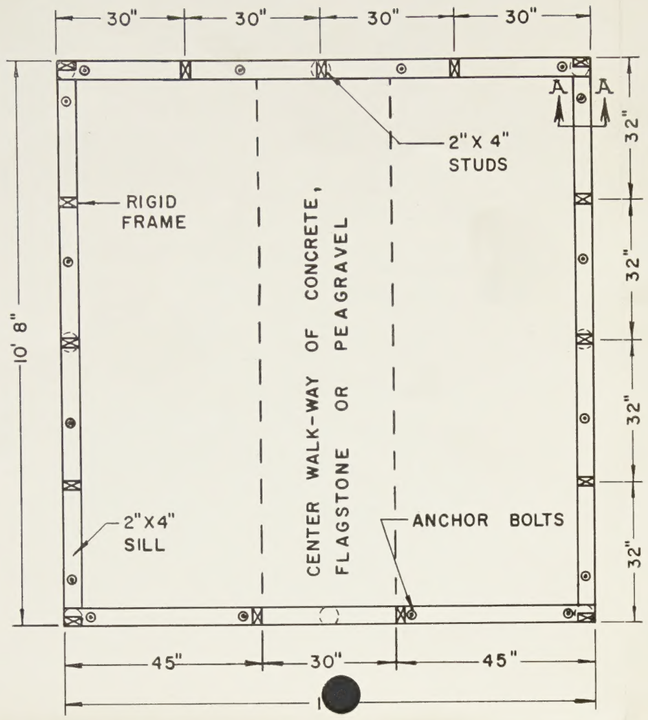
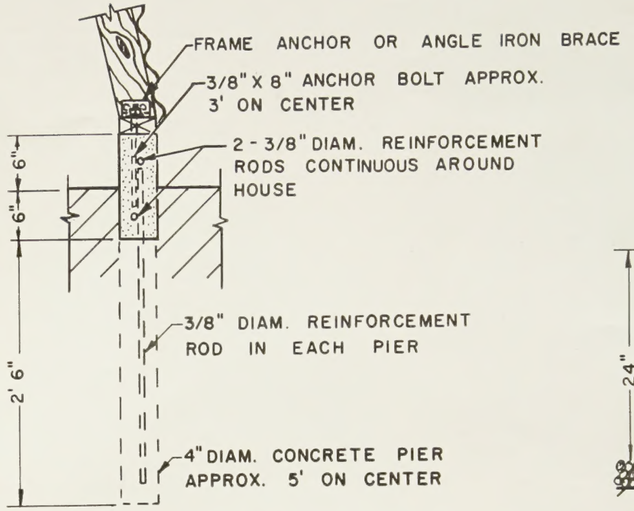
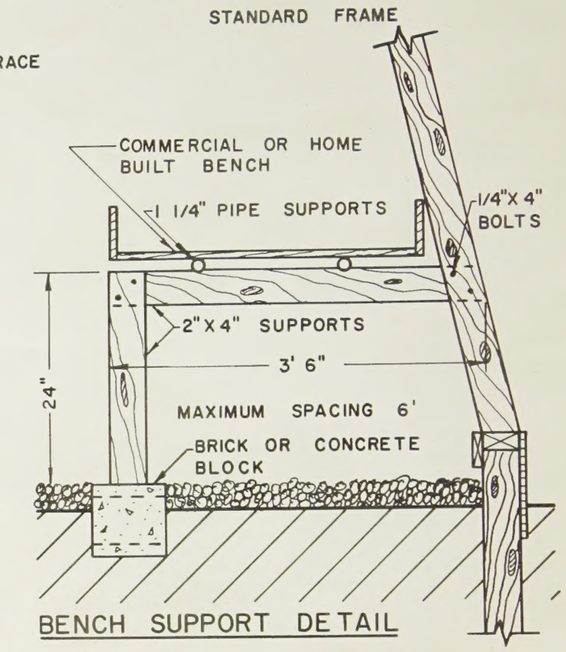


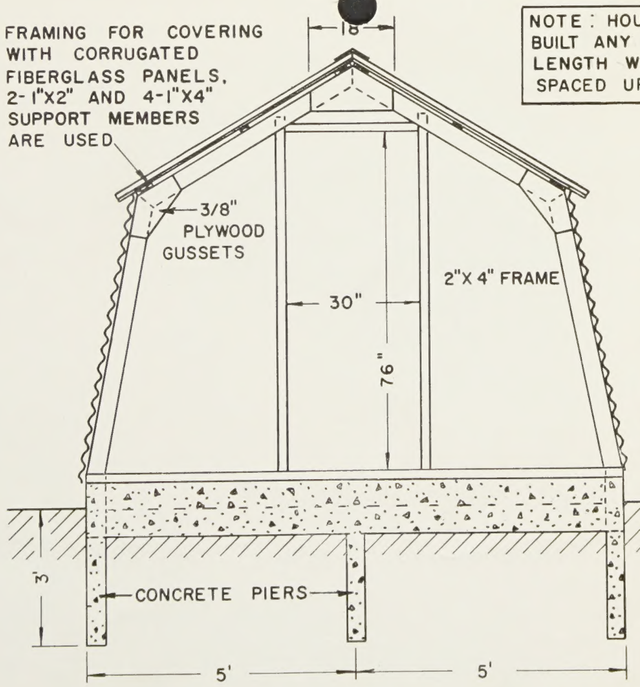
PLAN AND ELEVATION OF STRUCTURE ON CONCRETE


FRAME ANCHOR OR ANGLE IRON BRACE
3/8" X 8" ANCHOR BOLT APPROX. 3' ON CENTER
2 - 3/8" DIAM. REINFORCEMENT RODS CONTINUOUS AROUND HOUSE
6"
6"
3/8" DIAM. REINFORCEMENT ROD IN EACH PIER
2' 6"
4" DIAM. CONCRETE PIER APPROX. 5' ON CENTER

SECTION A-A
CONCRETE FOUNDATION DETAIL

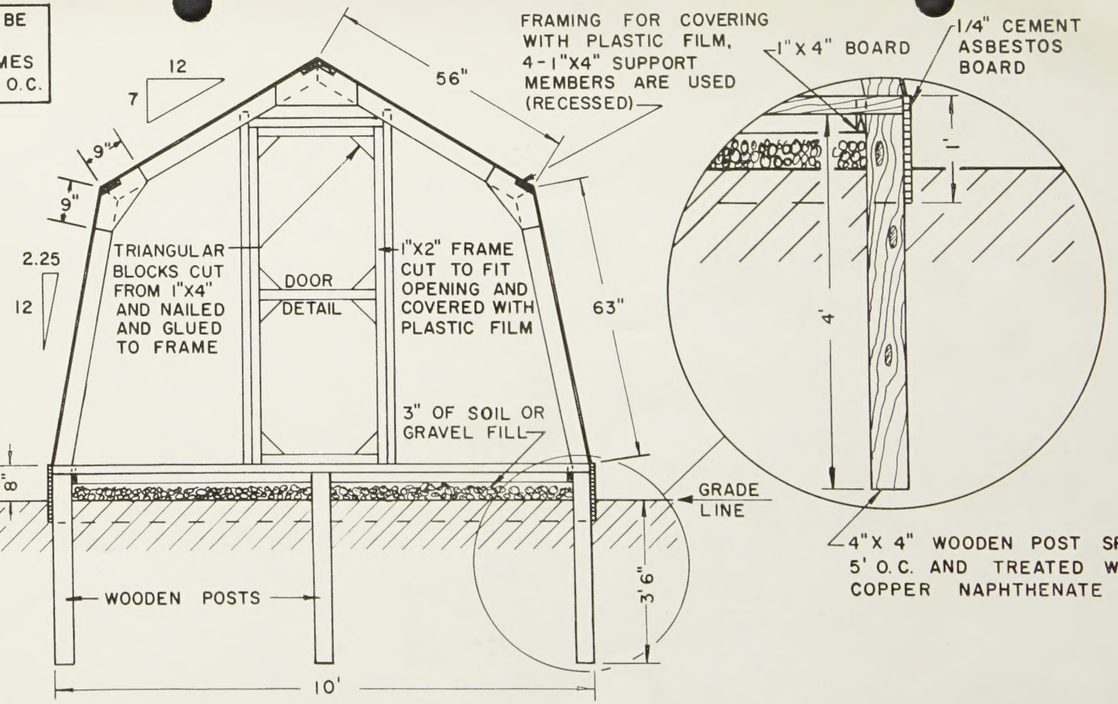


BENCH SUPPORT DETAIL



NOTE: HOUSE MAY BE BUILT ANY DESIRED LENGTH WITH FRAMES SPACED UP TO 36" O.C.

FRONT ELEVATION AND DETAIL OF ALTERNATE FOUNDATION



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Approximate Material Costs for a 10′ x 10′8″ Rigid Frame Home Greenhouse

Framing (lumber, glue, nails)	$ 50-60
Plastic (including necessary fasteners)	
Fiberglass	125–175
Vinyl	25–35
Polyethylene	15–20
Foundation	
Post	15–25
Concrete	30–50
Heater	75–125
Ventilation fan (shutters, wall box, guard, thermostat)	75–100
Benches (two 3′ x 10′, redwood or asbestos)	50–75

Paint. All wooden framing members should be painted with a good white paint. Special greenhouse paint, which usually contains a fungicide, is preferable. Paints which give off toxic vapors, especially those containing mercury compounds, should be avoided.

Benches and wood members in or near the ground can be treated with a good wood preservative such as 2 percent copper naphthenate. Never use creosote or pentachlorophenol preservatives in a greenhouse.

Heating and ventilation. The greenhouse must be properly heated and ventilated for year-round enjoyment. Thermostatically controlled exhaust fans, rather than manual vents, are recommended for positive ventilation of this rigid frame home greenhouse. Refer to University of Illinois Circular 879, *Home Greenhouses,* for information on heaters for small greenhouses, amount of heat required, and ventilation.

Prepared by J. W. Courter, Associate Professor of Horticulture, and J. O. Curtis, Professor of Agricultural Engineering.

Urbana, Illinois

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